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THE GENUS *WIGHTIA* WALL. IN INDIA WITH A DISCUSSION ON ITS SYSTEMATIC POSITION

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ABSTRACT

The paper deals with the taxonomy and distribution of the genus *Wightia* Wall. in India. A discussion on the systematic position of the genus is presented. It is suggested here that the tribe *Paulownieae* (including *Paulownia* Sieb. & Zucc., *Wightia* Wall., and *Brandisia* Hook. f. & Thoms.) should be removed from the Scrophulariaceae and assigned its proper place in the Bignoniaceae. An emended and amplified description of the tribe *Paulownieae* Pennell emend. Maheshwari, is also given.

The genus *Wightia* was established by Wallich in *Plantae Asiaticae Rariores* (1830) for an interesting, hemi-epiphytic, woody tree (*Wightia gigantea* Wall.) collected by himself in Nepal in 1821. It was named in honour of Robert Wight (1796-1872), the author of *Icones Plantarum Indiae Orientalis.* A good figure of the species, *W. gigantea* Wall. was provided (loc. cit., t. 81). Five more species have been described from the Indo-Malayan region by Hooker (1883), Koorders (1912), Craib (1913) and Merrill (1938). According to van Steenis (1949), the discrimination of the six species is difficult, as the characters of foliage and indumentum are very variable, while the proportions of calyx lobes to calyx tube and corolla lobes to corolla tube are equally unreliable. It is probable that there is only one continental species, *W. speciosissima* Merr. *sens. lat.* (syn. *W. gigantea* Wall.) of which some extremes have been described as separate species (*W. aplinii* Craib, *W. lacei* Craib, *W. elliptica* Merr.).

Most authors of Indian and Malayan floras include the genus in the Scrophulariaceae, but the best place for this genus seems to be in the Bignoniaceae (*see* discussion on systematic position).

Wightia Wall. Pl. Asiat. Rar. 1: 71, t. 81, 1830; Endlicher, Gen. Pl. 713, 1839; Benth. & Hook. f. Gen. Pl. 2: 938, 1880; Hook. f. Fl. Brit. Ind. 4: 257, 1884; Durand, Index Gen. Phan. 293, 1888; Wettstein in Engler & Prantl, Nat. Pfam. 4(3b): 64, 1897; Dalla Torre & Harms, Gen. Siphonogam. 456, 1900-1907; Hallier, Bull. Herb. Boissier, ser. 2, 3: 194-196, 1903; Prain, J. Asiat. Soc. Beng. 74: 342, 1906; Ridley, Fl. Mal. Penins. 2: 472, 1923; van Steenis, Bull. Bot. Gard. Buitenzorg, ser. 3, 18: 223, 1949; Bor, Man. Ind. For. Bot. 330, 1953.

Large liana, 6 to 10 m. high, scandent on oaks, rocks etc., sometimes found as a tree on its own roots. Branches often spreading or pendent, lenticellate. Wood soft, with two kinds of medullary rays, narrow and broad ones (*fide* van Steenis). Leaves opposite, decussate, simple, entire, coriaceous, glabrous above, puberulous below, with conspicuous glands mostly near the nerve-axils, petiolate, exstipulate.

Flowers in axillary thyrses or racemes appearing when the plant is leafless, large, rosy, purple, pubescent or tomentose, hypogynous; peduncle trichotomous, stellate-hairy. Calyx campanulate, coriaceous, quadrifid or irregularly 3-5-lobed; lobes broadly rotundate. Corolla pubescent; tube incurved, enlarged above; upper lip erect, 2-lobed; lower spreading, 3-fid; lobes broadly rotundate. Stamens four, didynamous, ascending, exserted, fixed near base of corolla; anthers glabrous, basifixed, oblong-sagittate, base bilobed, apex subconnate; loculi equal, parallel, splitting lengthwise, ±introrse. Posterior stamen rudimentary. Staminodes absent. Gynoecium bicarpellary, syncarpous. Disc absent. Ovary superior, bilocular, each locule with one axile, lengthwise-fastened, thick placenta which is broadened in the middle; style long, thick, tip incurved; stigma simple, terminal; ovules in loculi numerous, ascending. Capsule oblong, oblong-lanceolate or ovoid, bivalvular, septicidal, many-seeded; valves long, subcoriaceous, separating from the persistent, placentiferous axis which is bipartite or entire. Seed numerous, linear or oblong, ascending, non-endospermic; testa membranous, hyaline, broadly winged all round; hilum basilar. Embryo cylindric, straight.

TYPE SPECIES: *Wightia speciosissima* (D. Don) Merr. syn. *W. gigantea* Wall.

DISTRIBUTION

This small Indo-Malayan genus of six species is distributed in Nepal, Bhutan, Assam, Bengal, Sikkim, Burma, Indo-China, South China, Malaya, Borneo and Java. The species are usually at home in mixed and upper hill forests from 900 to 2150 m. *Wightia speciosissima* (D. Don) Merr. of India occurs wild in the hill forests and ravines of Bengal, Assam, Nepal, Sikkim, Bhutan, Burma and South-western China ; sometimes cultivated. *W. borneensis* Hook. f. is found in primary rain forest and along lake shores of Malay Peninsula, Sumatra, Borneo and Java. A closely allied species, namely *W. ottolanderi* Koord. occurs in forests and ravines of Java and Sunda Islands ; gregarious on lava streams of Mt. Idjen in East Java.

Wightia speciosissima (D. Don) Merr. in J. Arnold Arbor. 19: 67, 1938, in obs. ; Li in J. Arnold Arbor. 25: 316, 1944 ; van Steenis in Bull. Jard. Bot. Buiten. ser. 3, 18: 224, 1949 ; Bor, Man. Ind. For. Bot. 330, 1953 (PLATE I). *Gmelina speciosissima* D. Don, Prodr. Fl. Nepal. 104, 1825 ; Schauer in DC. Prod. 11: 680, 1847. *Gmelina tacabushia* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 105, 1825. *Wightia gigantea* Wall. Cat. 2703, 1828, nomen, et Pl. Asiat. Rar. 1: 71, t. 81, 1830, cum descrip. ; Benth. in DC. Prod. 10: 301, 1846 ; Hook. f. Himal. J. (ed. 2) 2: 155, 1855 et Fl. Brit. Ind. 4: 257, 1884 ; Gamble, List Trees Darjeeling 59, 1896 ; Brandis, Ind. Trees 491, 1907 ; Cowan & Cowan, Trees N. Bengal 95, 1929 ; Fl. Assam 3: 377, 1939.

A large, evergreen, hemi-epiphytic tree or liana, clasping the boles of forest trees with horizontal aerial roots and often far overtopping other big trees, 20 m. high, girth 90 to 120 cm. Branches scandent or laxly subpendulous. Branchlets thick, cylindric, dark-coloured. Wood light, soft. Bark black, blaze light brown. Leaves opposite, subdecussate, deciduous, 15-30 x 7.5-15 cm., elliptic or ovate-elliptic, acute or obtuse, entire, coriaceous, glabrous above and below when young covered with minute, copious, stellate, deciduous pubescence, exstipulate, base acute or rounded ; lateral nerves oblique, distant, subopposite, prominent, yellowish, 6 to 7-paired ; veins transverse, reticulate ; petiole stout, 2.5-4 cm. long, terete, pubescent, sulcate above.

Thyrsi large, 10-20 cm. long, solitary, axillary, many-flowered, erect, narrow ; peduncle and rachis very stout, pubescent. Flowers pinkish or rosy, inodorous, numerous ; pedicels 2.5-4 cm. long, hoary-pubescent ; bracteole caducous. Calyx short, campanulate, pubescent, persistent, ca 8 x 8 mm. ; lobes rounded, equal. Corolla mealy, ca 2.5 cm. long, infundibuliform, pubescent outside ; tube compressed, gradually enlarged upwards ; limb spreading, 4-fid ; lobes ovate, obtuse, nearly equal ; upper hardly longer, ascending, bilobed, lower descending, concave. Stamens 4, didynamous, exserted, parallel, suberect, glabrous ; anthers subsaggitate-ovate, versatile, bilocular ; loculi parallel, equal ; filaments inserted at base of corolla tube, two of them somewhat shorter. Ovary ovate, glabrous, bilocular ; ovules many ; style cylindric, glabrous, hardly longer than stamens ; stigma clavate, obtuse, undivided, rosy ; hypogynous disc absent. Capsule ovoid, smooth, thinly coriaceous, 4 x 2 cm., acute, bivalvular, rarely (due to the abortion of one of the loculi) unilocular and univalvular ; valves coriaceous, boat-shaped, cuspidate, separating from the placentiferous axis. Seed numerous, small, oblong, light ; margin membranous, produced in linear, obtuse wings ; testa thin. Embryo cylindric, white ; cotyledones obtuse ; radicle inferior.

Flowers: Oct.-Jan. *Fruits*: March-May.

TYPE: *Wallich* 2703 (Isotype), Nepal, May 1821 (in CAL).

Herbarium specimens examined: NEPAL: without exact locality, *Wallich* 2703 (ISOTYPE! in CAL), May, 1821. SIKKIM: between Khersiong and Mahalderam, *S. Kurz* s.n. ; Champong, 5,000 ft., *C.B. Clarke* 25117 C, Oct. 7, 1875 ; Rungbie, *G. King* 2595 ; Rungbie, Sureil Road, *Prain's collector* s.n., Nov. 11, 1902 ; Kurseong, *G. King* 3065, Oct. 5, 1876 ; without exact locality, 3-6,000 ft., *J. D. Hooker* s.n. ; Munsong, *W. G. Craib* 294, Nov. 24, 1908. DARJEELING: 7,000 ft., *S. Kurz* s.n., Sept. 1868 ; 7,000 ft., *J. S. Gamble* 3444 B, Oct. 1874 ; 6000 ft., *J. S. Gamble* 9999, Oct. 1881 ; Lebong, 5,000 ft., *B. B. Osmaston* s.n., Nov. 19, 1903. BHUTAN: without exact locality, *J. Parkes* s.n., 1885. ASSAM: without exact locality, *King's collector* s.n. ; Jaintia Hills, no. 29 ; Khasi Hills, above Rudeing Sirkup, 3,200 ft., *U. N. Kanjilal* 2821, Oct. 22, 1913 ; Khasia Mountains, 4-5,000 ft., *J. D. Hooker* and *T. Thomson* s.n. ; Lushai Hills, *N. E. Parry* s.n. ; on the way to Singli, Manipur, 3,000 ft. *Herb. G. Watt* 5007, Jan. 1882 ; Khongui, Manipur, 4-6,000 ft., *Herb. G. Watt* 6748, April 26, 1882 ; Takepokong-Sirang, Siang F. D., N.E.F.A., 1737-2195 m., *R. S. Rao* 17844, Nov. 19, 1958. BURMA: Kyatpyrii, Ruby Mines District, 4-5,000 ft., *J. H. Lace* 5991, Oct. 21, 1912 ; Ruby Mines, *Abdul Huk* 237, March 1892 ; Above Mogok, Ruby Mines Division, 5,000 ft., *A. Rodger* 75, Nov. 19, 1909.

Distribution: Nepal ; Bhutan ; Assam ; Sikkim ; Bengal ; Burma ; Indo-China ; South-western China ; Java.

Vernacular names: Nepali: *Lakori ; Bauni-kath ;* Lepcha: *Bop-kung, Zeru-kung ;* Khasi: *Ka-slang.*

Uses: The soft wood is used by the Lamas for making idols for their temples. In N.E.F.A. region of Assam, the bark is scratched and boiled with water to trap birds. The species may be useful as an ornamental tree and for re-afforestation of bare lands and grasslands under dry conditions between 750 and 1500 m.

Notes: The species of this genus exhibit interesting features with regard to their mode of life which is not constant. They germinate in the ordinary way and in the absence of proper support, grow into small erect trees. If, however, there is another tree close at hand, the species develop horizontal stem-clasping roots which encircle the support and then it proceeds to climb by means of these roots and eventually overtops the crown of its support. The cord-like stems (properly "roots") may attain great dimensions ; Hooker (1855) mentioned 30 cm. for *Wightia speciosissima* Merr. If the supporting tree dies and is outlived by *Wightia*, the latter may appear finally as a tall tree. Sometimes it is found as a tree on its own roots, but usually the species is primarily epiphytic on oaks etc., subsequently assuming an arboreal habit characteristic of many species of *Ficus.*

SYSTEMATIC POSITION

The taxonomic affinities of *Wightia* have been interpreted differently by systematists. This is because the genus bears ancient characters which give the plant its intermediate position reflecting various close relations within the group Personales. Wallich (1830), who discovered the genus in Nepal Himalayas, assigned it to the Bignoniaceae, but stated that it was "very distinct from all the other genera belonging to Bignoniaceae, the characters of which it resembles in some degree". In *Genera Plantarum,* Bentham and Hooker (1880) placed the genus in the Scrophulariaceae, series Antirrhinideae, tribe Cheloneae; however, referring under "Genera Exclusa v. Dubia" that it appears somewhat similar to the genus *Catalpa* of Bignoniaceae. Pennell (1920) proposed a new tribe, Paulownieae, in the subfamily Antirrhinoideae of Scrophulariaceae and included two Asiatic genera, *Paulownia* and *Wightia.* He characterized the tribe Paulownieae as having large leaves, paniculate inflorescences, leathery sepals clothed with stellate hairs, elongate corolla tubes and overlapping broad-winged seeds. This suggestion has been accepted by van Steenis (1949), Gleason (1952), Willis (1955), Shiu-Ying Hu (1959), and rejected by Campbell (1930), Hui-Lin Li (1944, 1947) and Lawrence (1951). Recently Nakai (1949) proposed a new family, Paulowniaceae, to which he assigned the only genus *Paulownia.* As early as 1903, Hans Hallier suggested that *Paulownia* and *Wightia* should be placed in Bignoniaceae. He was followed by Campbell (1930), Hui-Lin Li (1944, 1947) and Lawrence (1951). The genus was also listed among "Genera Anomala" under Bignoniaceae in Endlicher's *Genera Plantarum* (1839). In a review of the Bignoniaceae of India and Burma, Chatterjee (1948) did not make any reference to this genus. D. Don (1825) and Schauer (1847) described the Wallichian species as *Gmelina speciosissima* D. Don, assigning the species to the Verbenaceae. A large number of authors (Hooker, 1883, 1884; Gamble, 1896; Prain, 1906; Brandis, 1907; Craib, 1913; Ridley, 1923; Cowan & Cowan, 1929; Merrill, 1934, 1938; Kanjilal, 1939; Bor, 1953; Willis, 1955), following such classical botanical references as Bentham and Hooker's *Genera Plantarum,* and Engler and Prantl's *Die Natürlichen Pflanzenfamilien,* include the genus in the Scrophulariaceae; but in its arborescent or liana-like habit, presence of extra-floral nectaries on the leaf surface, winged seeds and absence of endosperm ("Nährgewebe"), the taxonomic affinities of this genus lie with the Bignoniaceae. In the field, the genus is usually identified as a *Bignonia.* In *Genera Siphonogamarum* of Dalla Torre and Harms (1900-1907), *Index Generum Phanerogamorum* of Durand (1888) and *Index Kewensis* (1895), the genus is listed under Scrophulariaceae. It appears that these works probably picked up the name from Bentham and Hooker (1880) and Engler and Prantl (1897) where it is listed under Scrophulariaceae, because it is treated as "Genera Anomala" under Bignoniaceae by Endlicher (1839)—one of the works from which the Genera Siphonogamarum was originally compiled.

Wightia resembles the Bignoniaceae in the following respects:

Arborescent and liana-like habit; lenticellate branches; decussate, exstipulate leaves; presence of extra-floral nectaries on lower surface of leaves in or near the leaf axils; large flowers in axillary thyrses or racemes; cupuliform, thick calyx; form of corolla; four, epipetalous, didynamous stamens; hairy filament bases; bicarpellary, syncarpous gynoecium; superior, bilocular ovary; numerous ovules; capsular fruit dehiscing with two valves; winged, non-endospermic seeds.

Wightia differs from most genera of the Bignoniaceae in a few respects. For example:

Simple leaves; presence of stellate and dendroid hairs; bilipped corolla; absence of hypogynous disc and staminodia.

The following differences exclude the genus from the Scrophulariaceae:

Arborescent and liana habit; lenticellate branches; presence of extra-floral nectaries on lower surface of leaves in or near the leaf axils; cupuliform calyx; absence of hypogynous disc; winged seeds; absence of endosperm.

It may be stated that Hutchinson's (1926, 1959) classification of the dicotyledons into two great streams *viz.,* Lignosae and Herbaceae, although met with complete acceptance by few, throws greater emphasis on the woody and herbaceous nature of taxa. In a predominantly herbaceous family like Scrophulariaceae, apparently *Wightia* occupies an anomalous position. In fact, the Bignoniaceous *facies* is exhibited by *Wightia* to a marked degree; the lenticellate branchlets suggest at first sight those of *Tecoma, Catalpa* and other Bignoniaceae. However, it is now a common practice that in tackling problems of this kind, evidences from other fields of botany like anatomy, cytology, embryology, pollen grain morphology, microscopic structure of wood etc. are to be gathered and properly analyzed. Westfall's (1949) studies on the cytology, embryology and anatomy of an allied genus *Paulownia* suggest its placing in Bignoniaceae. In my opinion, there is ample external morphological evidence to show that the structure of *Wightia* is consistent with its being included in the Bignoniaceae. Its septicidal fruit reflects an approach to the tribe Bignonieae.

The author suggests that the tribe Paulownieae should be removed from the Scrophulariaceae and assigned its proper place in the Bignoniaceae. The following emendation and amplified description of the tribe Paulownieae Pennell, is proposed. This is done in accordance with the provisions of Articles 47 and 47 A of the Code.

BIGNONIACEAE A. Juss. tribe *Paulownieae* Pennell emend. Maheshwari. Syn.: *Cheloneae* Benth. &

Hook. f. Gen. Pl. 2: 917, 1880, pro parte; *Paulownieae* Pennell, Proc. Acad. Nat. Sci. Philadelphia 71: 226, 1920, ex parte; *Paulowniaceae* Nakai in J. Japanese Bot. 24: 13, 1949, ex parte.

Frutices vel arbores deciduae volubiles, ramulis robustis et lenticellatis. *Folia* opposita, simplicia, exstipulata, infra capillis dendroideis vel stellatis ornata. *Inflorescentia* axillaris, cymosa vel thyrsoidea. *Calyx* cyathiformis, obconicus vel campanulatus, persistens, subinteger vel lobatus. *Corolla* speciosa, zygomorpha, digitiformis, infundibuliformis, tubulosa vel bilabiata, distincte 5-lobulata. *Stamina didynama*, omnia fertilia. Ovarium biloculare, axile; ovula plura; placenta dilatata. *Discus* nullus. *Capsula* ovoidea vel oblongo-ellipsoidea, lignosa vel crustacea, septicida vel loculicida, columna centrali axili persistente placentifera semina supportante. *Semina* plura, alata, embryone cylindrico, endospermo nullo vel sparso.

Deciduous trees, shrubs or lianas with stout and lenticellate branchlets. Leaves opposite, simple, exstipulate, with dendroid or stellate hairs beneath. Inflorescence axillary, cymose or thyrsoid. Calyx cupuliform, obconic or campanulate, persistent, subentire or lobed. Corolla showy, zygomorphic, digitiform, infundibuliform, tubular or bilipped, distinctly 5-lobed. Stamens didynamous, all fertile. Ovary bilocular, axile; ovules numerous; placenta enlarged. Disc absent. Capsule ovoid or oblong-ellipsoid, woody or crustaceous, septicidal or loculicidal, with a central, axile, persistent placentiferous column bearing the seeds. Seeds numerous, winged; embryo cylindric; endosperm none or scanty.

TYPE GENUS: *Paulownia* Sieb. & Zucc. Fl. Jap. 1: 25, t. 10, 1835.

GENERA: *Paulownia* Sieb. & Zucc., *Wightia* Wall., and *Brandisia* Hook. f. & Thoms.

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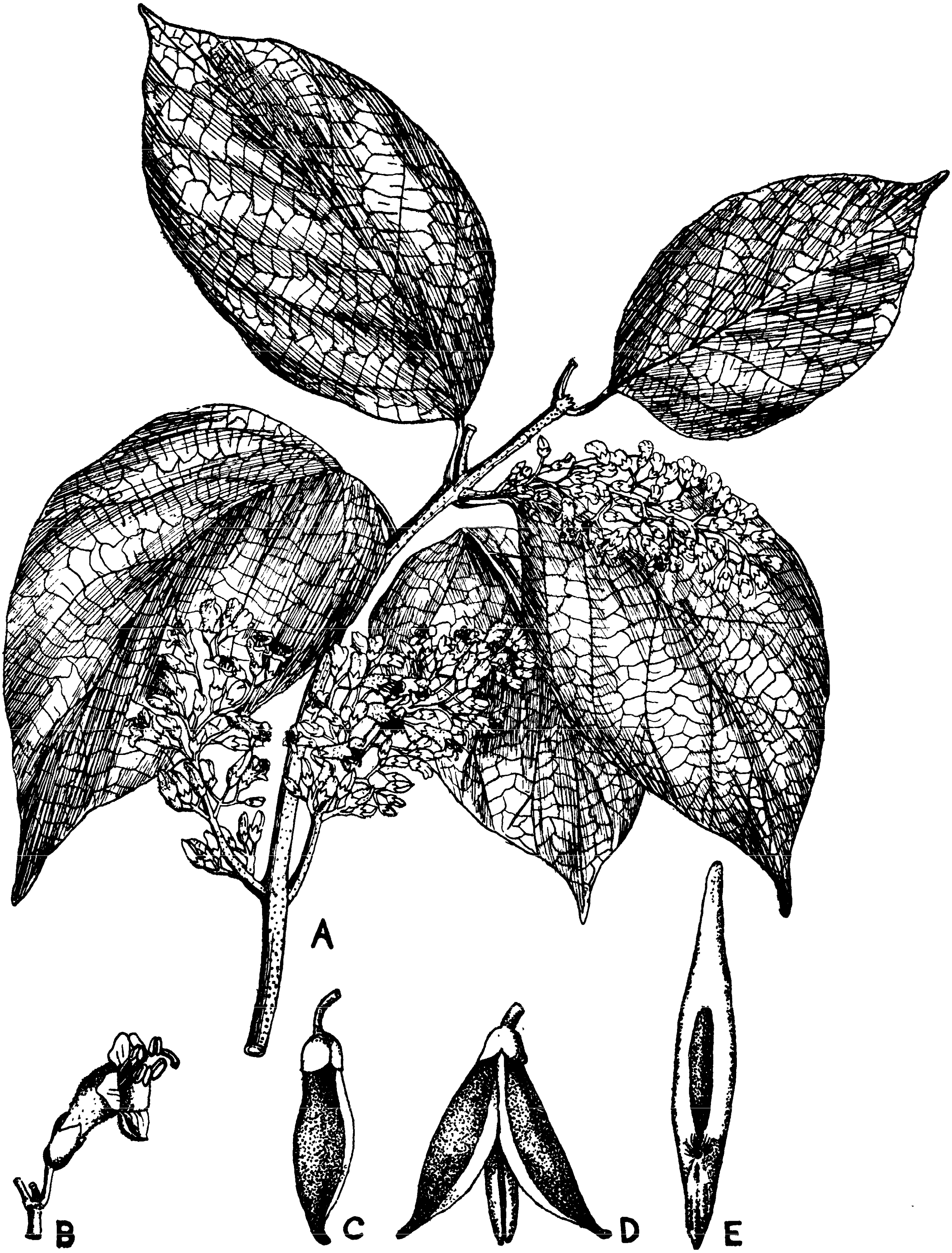

Wightia speciosissima (D. Don) Merr.
Fig. A. Flowering twig ×0.5 ; Fig. B. Flower ×1 ; Fig. C. Capsule ×1 ;
Fig. D. Dehisced capsule ×1 ; Fig. E. Seed ×5.